

REMARKS

Claims 1-8, 10-15, 17, 19 and 20 are pending in this application. Claims 1-8, 10-15, 17, 19 and 20 are finally rejected.

By this paper – submitted concurrently with a Request for Continued Examination - independent claims 1, 10, 17, 19, and 20 are discussed while new claims 21-25 are presented.

In view of the following discussion, the applicants believe that all of the claims now present in the application are allowable. If, however, the Examiner believes that there are any unresolved issues requiring adverse action in any of the claims now pending in the application, it is requested that the Examiner telephone Jeffery J. Brosemer, Ph.D., ESQ. at 732-335-5773 so that arrangements may be made for resolving such issues as expeditiously as possible.

New Claims 21-25

Claims are added by this paper submitted concurrently with a Request for Continued Examination. The new claims correspond substantially to pending independent claims 1, 10, 17, 19, and 20 however they include a particularly distinguishing aspect of the claimed invention namely a characteristic of the deep saturation regime wherein $-4\text{dBm} < P_{\text{IN}} < 4\text{dBm}$. The applicants submit that explicit support for this recitation is found in the specification and that none of the references teach or suggest this aspect of the claimed invention either explicitly or implicitly in any combination. Accordingly, the applicants submit that these new claims are allowable over the cited art.

Claim Rejections – 35 U.S.C § 103(a)

Claims 1-8, 10-15, 17, 19 and 20 are rejected under the provisions of 35 U.S.C § 103(a) as being unpatentable over Yiannopoulos (IEEE Photonics Technology Letters, Vol. 15, No. 6, June 2003) in view of Cho et al (IEEE Photonics Technology Letters, Vol. 15, No. 1, January 2003), further in view of Gnauck (US 2002/0021861).

Before discussing this art however, the applicants urge the Examiner to reconsider whether the prior art of record teaches or suggests the operation of a semiconductor optical amplifier as now taught and claimed. The applicants believe not.

More particularly, each of the independent claims very specifically recites that the semiconductor optical amplifier operates in a **deep saturation mode** defined by: $\Delta P_{\text{OUT}}(\text{dB}) / \Delta P_{\text{IN}}(\text{dB})$ is less than 0.25, where P_{OUT} is the power of the optical signal output from the amplifiers, and P_{IN} is the power of the optical signal input into the amplifiers.

The applicant's reasoning is as follows.

Gnauck does not teach or suggest operating a Semiconductor Optical Amplifier (SOA) in deep saturation.

- (a) Figure 1 of Gnauck describes an Erbium-Doped Fiber Amplifier (EDFA) and not an SOA. (see, e.g., Par. 0004).
- (b) The applicants submit that this figure is clearly meant to be illustrative and not quantitative. Therefore, the applicants submit that attempting to find a “deep saturation region” within that figure is clearly reading too much into that figure.
- (c) The specific invention that Gnauck discloses and claims plainly operates in the linear – and at most a marginally saturated region. In that regard, Gnauck’s clear objective is to operate SOAs in the linear region “... none of the prior art schemes address the issue of the viability of using SOA’s operating in a linear mode ...” therefore the applicants submit Gnauck explicitly teaches away from operation in deep saturation.
- (d) Gnauck only cites certain prior art that operates an SOA in saturation. Gnauck indicates that operating an SOA in saturation is disadvantageous and explicitly rejects that operation and describes/advocates his linear operation of the SOA. Nowhere does Gnauck describe or identify any operation in *deep* saturation as now taught and claimed.

Consequently, the applicants submit that Gnauck fails to teach or suggest SOA operation in a deep saturation regime as now taught and claimed and requests that the Examiner identify art which does so teach or withdraw the rejections substantiated by Gnauck.

With respect to the Cho reference, the applicants submit that this reference too fails to teach or suggest the operation of an SOA in deep saturation as now taught and claimed. The applicants reasoning with respect to Cho is as follows.

- (a) Cho reports on experiments performed with RZ-DPSK signals amplified by an SOA that varied from unsaturated to moderately saturated – but – never in *deep* saturation. The signal inputs that Cho reports in detail are -14, -17, and -20. Hence, never more than borderline saturated. Never a mention, indication, or data indicative of deep saturation.
- (b) Cho reports that for the DPSK signal, the optimal input power was about -17 dBm. This is right smack in the middle of the linear regime, 3dB below the saturation threshold.
- (c) Cho reports that even though no pulse pattern effect (the bad distortion allegedly suffered when you operate SOAs in saturation with a gain recovery time comparable to the pulse period in an optical signal) was observed for input powers up to -10 dBm for the DPSK signal, degradation of the BER was observed. Now, -10dBm is only 4dB

over the saturation threshold so it is nowhere near deep saturation. In fact, Liu Figure 2 indicates that deep saturation begins at 10 (ten) dB over saturation. So, what Chu is reporting is that bad things happen even when you go this short distance into the saturation region, namely signal degradation due to amplified spontaneous emission and four-wave mixing. Accordingly, the applicants submit that Cho is teaching away from operation in a deep saturation regime and submit further that one skilled in the art would simply not be motivated to go there because of the negative effects on the signal.

Consequently, the applicants submit that a communications method employing the operation of a semiconductor optical amplifier in "deep saturation" as that term is used in the independent claims of the instant application is not obvious in view of the cited art.

Conclusion:

The applicants submit that all of the claims now present in the application fully comply with the provisions of 35 U.S.C. § 103 and are therefore allowable. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

Respectfully submitted,
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CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. 1.8(a)

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office on March 25, 2011.

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